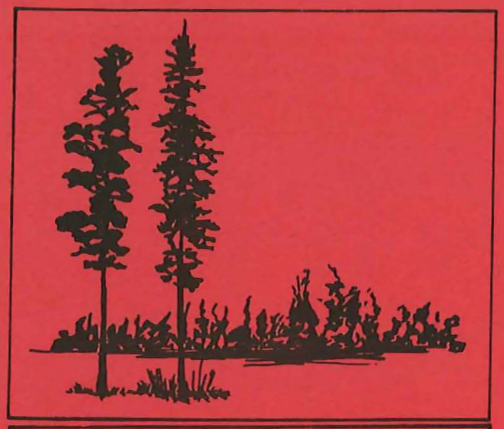

FOREST PEST CONDITIONS IN WISCONSIN

ANNUAL REPORT 1984

DEPARTMENT OF NATURAL RESOURCES
BOX 7921
MADISON, WISCONSIN 53707

FOREST PEST CONDITIONS IN WISCONSIN ANNUAL REPORT - 1984

Compiled and Edited by Allen J. Prey, David J. Hall, and Jane E. Cummings

DEPARTMENT OF NATURAL RESOURCES
Division of Resource Management
Bureau of Forestry

ACKNOWLEDGEMENTS

This record of the activities of forest pests and other destructive agents of growing trees in Wisconsin's forest nurseries, plantations, and natural timber areas was made possible by the dedicated work of pest management personnel in each district and at the Forest Pest Management Laboratory in Madison. DNR foresters, other Department field personnel, cooperators in other public agencies and private forest industry contributed valuable assistance in monitoring the forest lands in all classes of forest ownership.

Preparation of the Annual Report is a result of a team effort involving Stanley Banash, Frank Morse and Shane Weber, DNR District Entomologists who submitted district reports. Jane Cummings and Dave Hall, Forest Pest Unit, Madison, consolidated the District reports and wrote the final draft. Beth Schuh, Forest Pest Unit, prepared the maps and Chris Trevorrow of the Southern District Program Services did the word processing. Final printing was done by the DNR Bureau of Program Services.

I would like to thank all who have contributed to the report, especially Stanley E. Banash former DNR District Entomologist stationed at Antigo who retired on December 7, 1984 after more than 32 years of dedicated service. Prior to retirement, Stan conducted forest pest surveys in 18 counties within two DNR Districts (North Central and Lake Michigan) and served as DNR Pesticide Safety and Use Coordinator in the North Central District. His enthusiasm, dedication to hard work, and ability to expertly diagnose, monitor and control forest pests will be missed.

Allen J. Prey
Supervisor, Forest Pest Management
April 23, 1985

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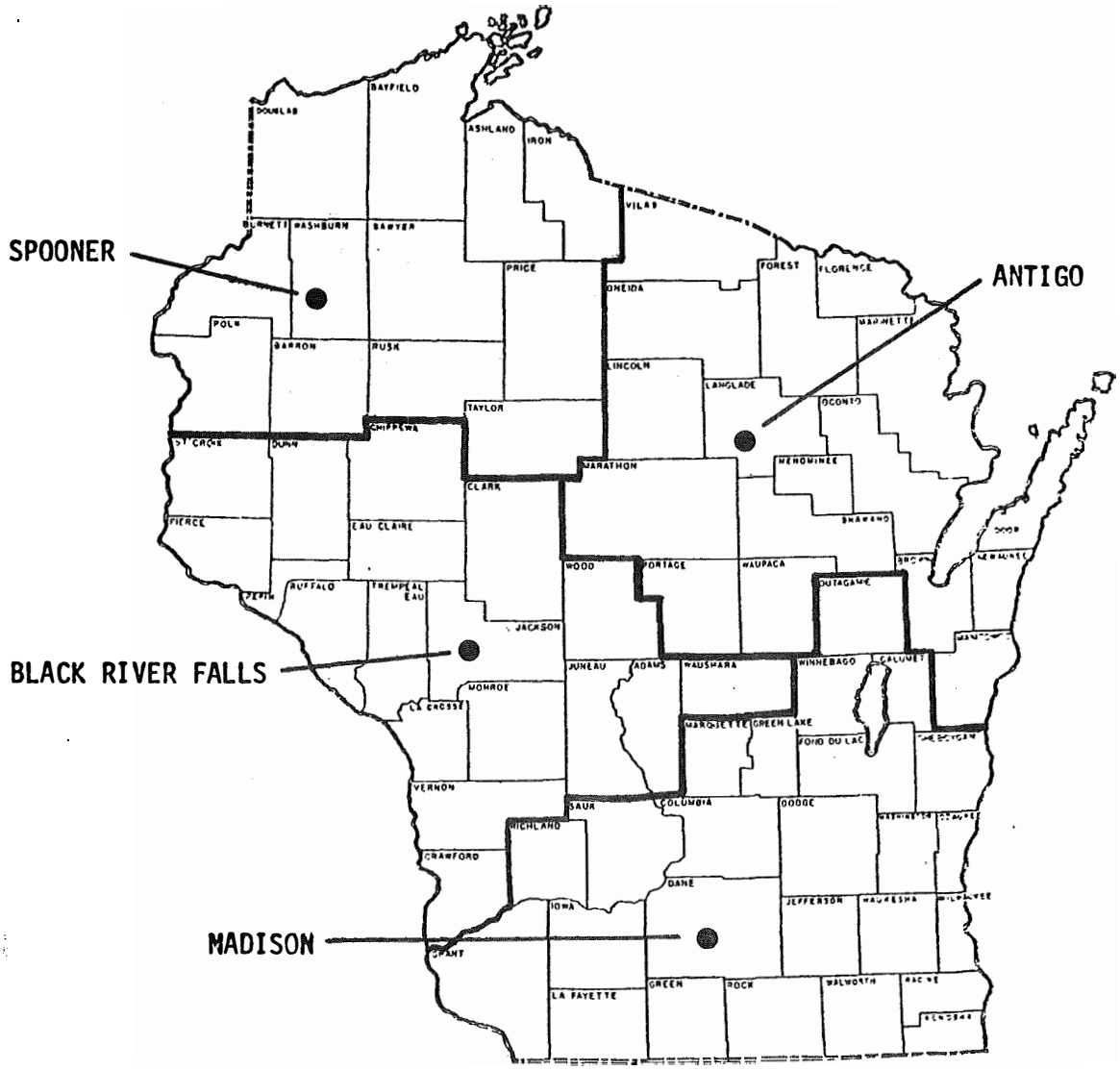

Figure 1. Station locations of Wisconsin Department of Natural Resources District Entomologists and Forest Pest Unit Personnel.

Department of Natural Resources - 1984
Forest Pest Management Personnel

Name	Title	Address	Telephone
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* *

Banash, Stanley E.	District Forest Entomologist	DNR, Ranger Station 1635 Neva Road, Box 48 Antigo, WI 54409	715-627-4317
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Introduction

This report lists the major insect and disease problems reported on forest land in Wisconsin in 1984. This report has been published since the enactment of the Forest Pest Control Act of 1955. While this report does not list all the insect and disease problems that occurred on forest land, it does highlight major or noteworthy insect infestations, and disease occurrences including abiotic damage to trees.

In addition to surveying approximately 13 million acres of forest land for pests in 1984, DNR District Entomologists and Forest Pest Staff were responsible for teaching integrated pest management principles to DNR foresters, industrial foresters and private woodland owners. Red Pine Pest Management Training sessions were held at Barnes, Manitowish Waters and Crivitz, WI. Also a paper on Red Pine Pest Management Guidelines for Wisconsin was presented at a Society of American Foresters Regional Technical Conference held at Marquette, MI.

A forest pest exhibit displaying forest pest leaflets and free pest diagnostic services were available at the Wisconsin Christmas Tree Producers Annual Meeting at Green Bay in July, 1984. A similar display was presented at the Wisconsin State Society of American Foresters meeting and Jack Pine Symposium held in Wisconsin Rapids in February, 1984 and at Farm Progress Days near Jefferson in October 1984.

Teaching the safe use of pesticides and assisting the University of Wisconsin Extension with pesticide applicator training was also a responsibility of the entire Forest Pest Management staff. Each District Entomologist was appointed District Pesticide Coordinator, in charge of numerous DNR activities such as pesticide use, reporting, permits and certifications. Computerized "Herbicide Comparison and Effectiveness Charts" were developed and distributed to Wisconsin foresters. Pest management guidelines were developed for nine timber types and submitted for publication in the DNR Silvicultural and Aesthetics Handbook.

A survey program for detecting red-headed pine sawfly with a sex pheromone was initiated using sex pherome baited traps.

The Forest Pest Unit also worked with the Wisconsin Department of Agriculture and USDA in high density trapping and the use of the bacterial insecticide Bacillus thuringiensis to reduce the gypsy moth population in Oconomowoc Township.

Systemic insecticides where tested in a DNR red pine seed orchard near Avoca, WI in an attempt to reduce cone worm populations. Approximately 60% viable seed was obtained from treated trees vs. less than 1% in untreated trees.

The DNR Forest Pathologist lead an interagency Nursery Disease Control Swat Team in reducing losses in Lake States nurseries from disease such as Diplodia shoot blight, gall rust of pine, and white pine root rot.

The pathologist also trained State Park personnel and foresters in the Southern and Southeast districts on the "Recognition of Diseased and Defective Trees in Public Use Areas."

A volunteer program was initiated at the Forest Pest Laboratory. Volunteers have assisted in aerial surveys and in laboratory work such as labeling slides and filing insect records.

The University of Wisconsin-Madison hosted three forest entomologists and one forest pathologist from the People's Repbulic of China. DNR District Entomologists and forest pest staff arranged and participated in field trips for the visiting scientists.

ASPEN

Aspen Bronzing - Unknown

This disease has been observed on large-toothed Aspen and quaking aspen. On large-toothed aspen, bronzing of leaves in the lower crown occurs during July and August, followed by necrosis in September and death of branches with bronzed leaves in subsequent years. On quaking aspen, chlorotic and recrotic leaf spots are scattered throughout the crown in June and July with bronzing developing in late July and August. Three new locations were reported in 1984. Two locations in Dane County, a clone of large tooth aspen in Deerfield township and two hybrid poplars in the City of Madison, showed symptoms of aspen bronzing. Bronzing was also observed of a clone of trembling aspen in Adams County, R6E, T18N, Sec. 8. (Figure 2).

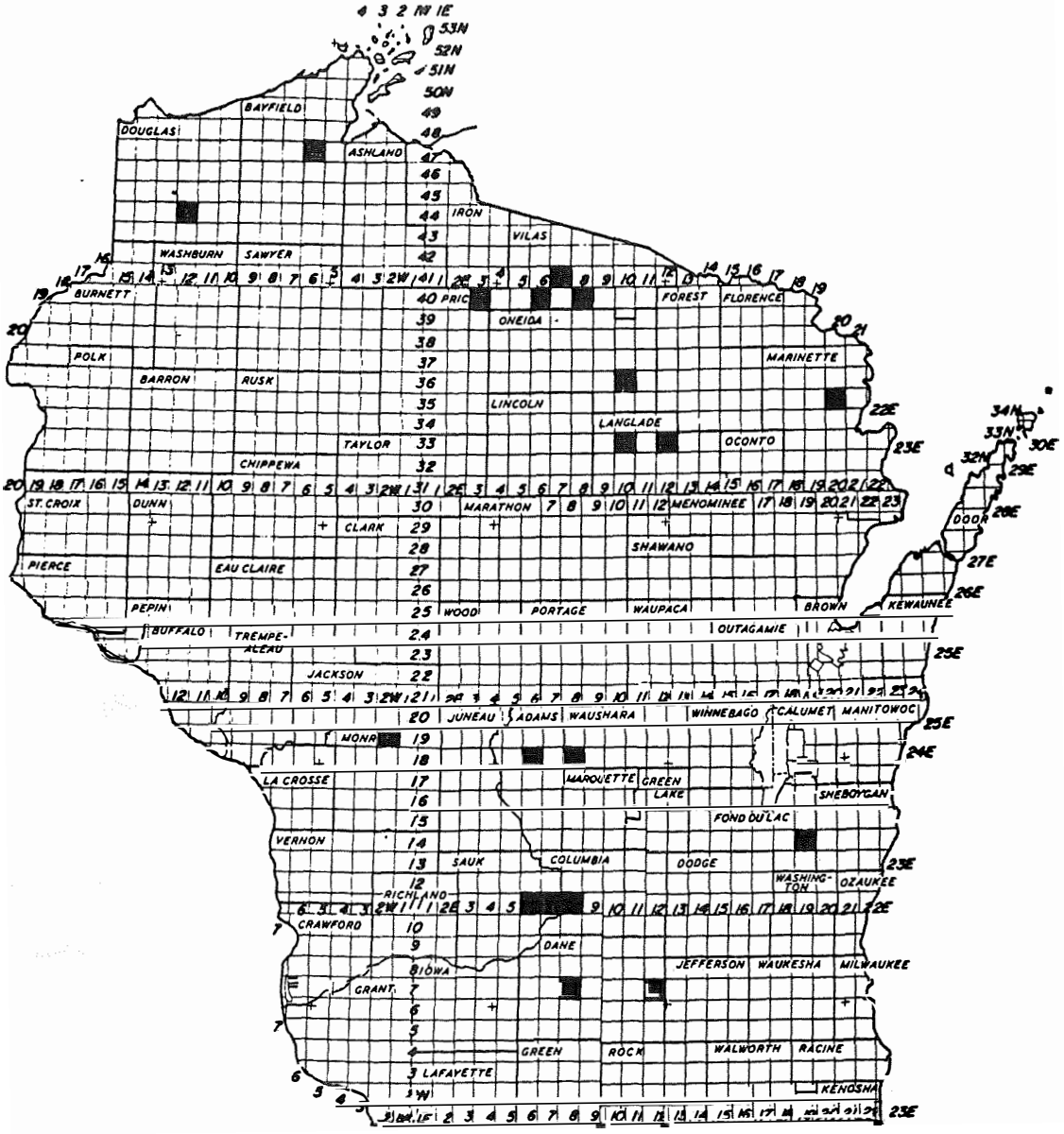

Figure 2. Township locations of Aspen Bronzing in Wisconsin - 1984.

Aspen Blotchminer - Phyllonorycter tremuloidiella (Braun)

Defoliation was greatly reduced in 1984. Pockets of defoliation were apparent in Vilas, Forest, and Oneida Counties.

Forest Tent Caterpillar - Malacosoma disstria (Hubner)

The outbreak in northern Wisconsin continued to decline. An aerial survey by Forest Service - S&PF revealed 95,924 acres of aspen defoliated in Ashland and Iron Counties (Figure 3).

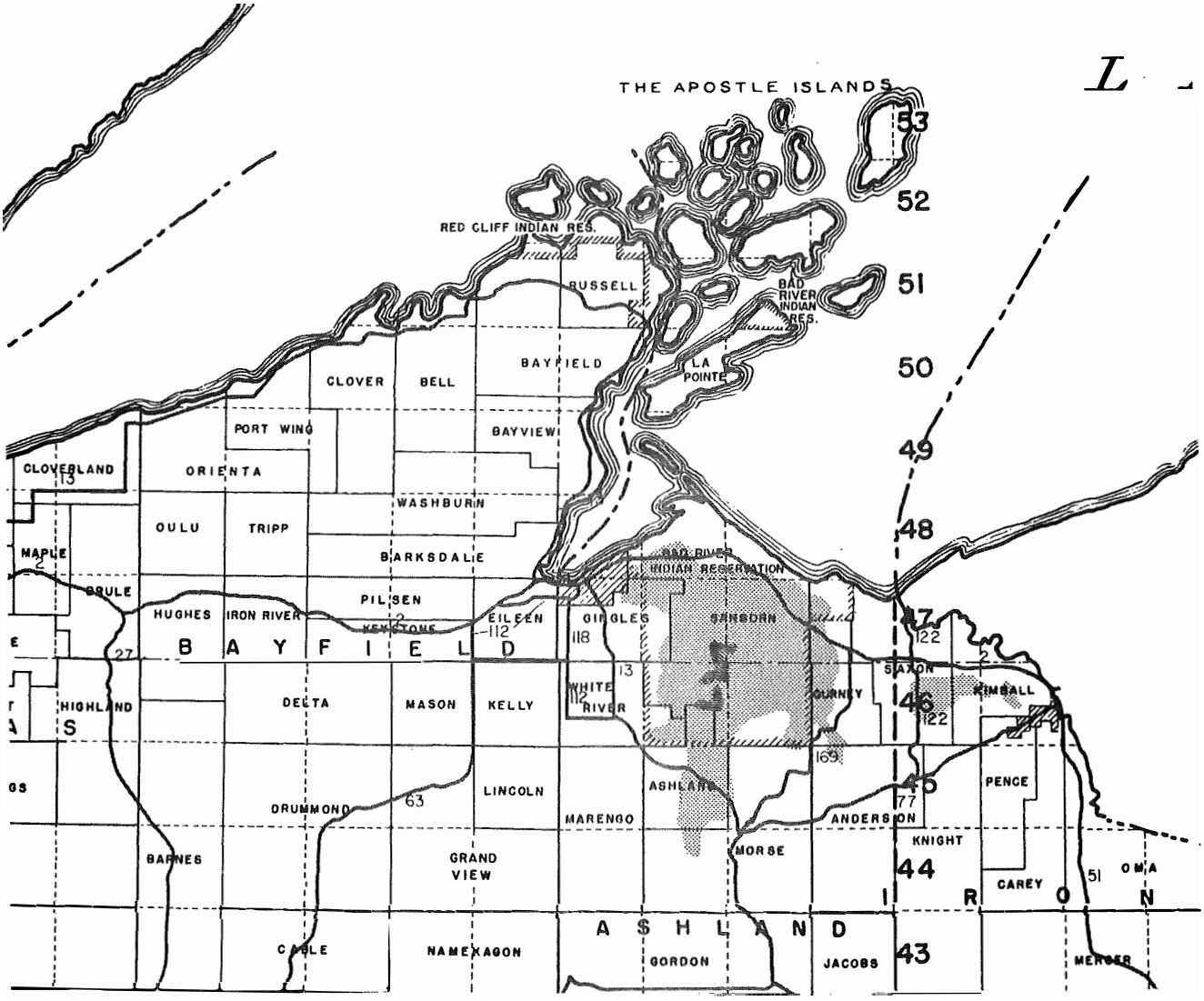

Figure 3. Area of heavy (dark gray) and light to moderate (light grey) defoliation by the Forest Tent Caterpillar, 1984.

BALSAM FIR - SPRUCE

Spruce Budworm - Choristoneura fumiferana (Clemens)

Defoliation continued in several pockets in the northern counties.

In Ashland County (T45N, R4W; T44N, R3W; T44N;, 4W; T43N, R3W) about 15,000 acres of balsam fir suffered heavy to severe defoliation; about 2,000 cords are dying from 1983 & 1984 defoliation.

In Price County (T39N; T40N, R2E) about 5,000 acres were moderately defoliated.

About 2,050 acres were moderately defoliated in pockets in Langlade and Oneida Counties.

Phenological notes:

May 30 - Larvae in 3rd instar in Washburn County
June 27 - Majority in pupal stage
July 3 - Adults laying eggs in northern counties

Balsam Gall Midge - Paradiplosis tumifex (Gagne)

Very high populations occurred in Price, Marinette, Marathon, Oconto, Lincoln, Langlade in Christmas trees and natural stands.

May 20 - Eggs hatching in Price County
May 21 - Adults laying eggs in Langlande County
May 30 - Galls beginning to form in Price County

Balsam Twig Aphid - Mindarus abietinus (Koch)

Populations generally increased. Heavy populations were reported on balsam Christmas trees in Eau Claire, Clark and Jackson Counties. Rising populations were reported on natural balsam in Washburn County. A grower in Marathon sprayed with Malathion.

BASSWOOD

Basswood Thrips - Sericothrips tiliae (Hood)

Spring defoliation increased in area and intensity in the northern counties. The basswood component of 260,000 acres of northern hardwoods was moderately to heavily defoliated in Sawyer, Rusk, Taylor and Price Counties (Figure 4). A large area of difuse, light-to-heavy defoliation occurred in eight northeastern counties.

In Rusk County, despite several years of defoliation the basswood appear vigorous. The only known tree mortality associated with this insect occurred in overstocked pole and small sawtimber in 1983.

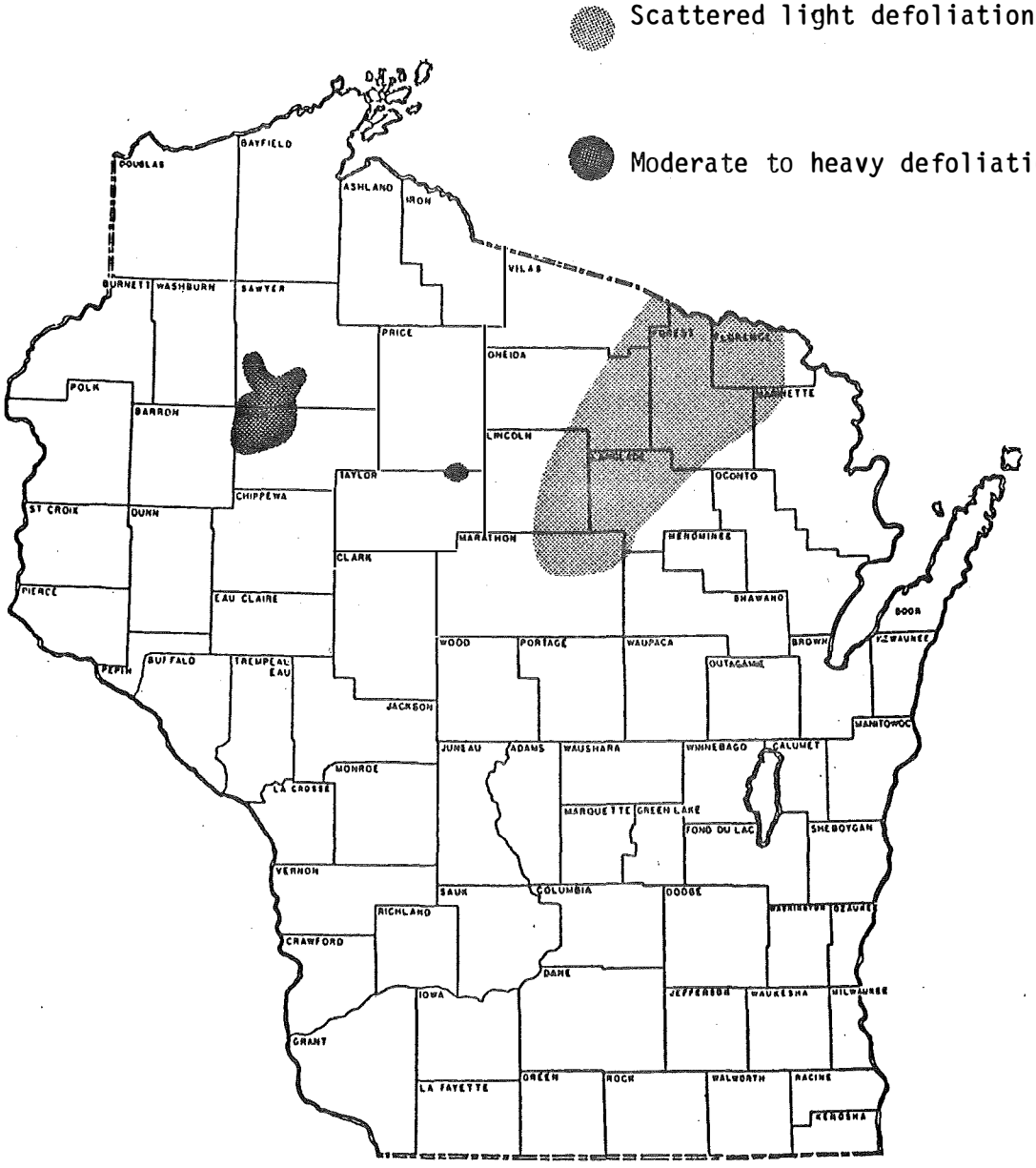

Figure 4. Area of defoliation of basswood by Basswood Thrips - 1984.

BIRCH

Birch Leafminer - Fenusa pusilla (Lepeletier)

The infestation persisted in northern Wisconsin. Ornamental birch suffered light to moderate defoliation in Washburn and Sawyer counties. Light defoliation occurred in forest stands in Sawyer, Price and Ashland Counties.

Birch Skeletonizer - Bucculatrix canadensisella (Chambers)

About 5,000 acres of heavy to severe defoliation occurred in Douglas County (T 46N, R13W; T 47N, R 13W). Most trees lost 75% or more of their leaves to this late-summer defoliator. The large infestation in Sawyer and Price Counties collapsed this year.

Severe defoliation occurred in Eastern Oneida, and Eastern Vilas Counties.

Top Dying of Yellow Birch - heavy seed production

Top dying of yellow birch was observed throughout northern Wisconsin in June. Subsequent examination of the tops of yellow birch on the Menominee Indian Reservation in northeastern Wisconsin, revealed branches with sparce foliage and a heavy production of staminate catkins and strobiles. Although there were few vegetative buds on these branches, the buds were still alive. Several affected trees have been marked and will be checked next year.

BUTTERNUT

Butternut Canker - Siroccoccus sp.

No new county locations of butternut canker were observed in 1984. This disease continues to kill butternut in the 21 counties where it has been previously reported (Figure 5). Trees of all ages and on all types of sites are infected.

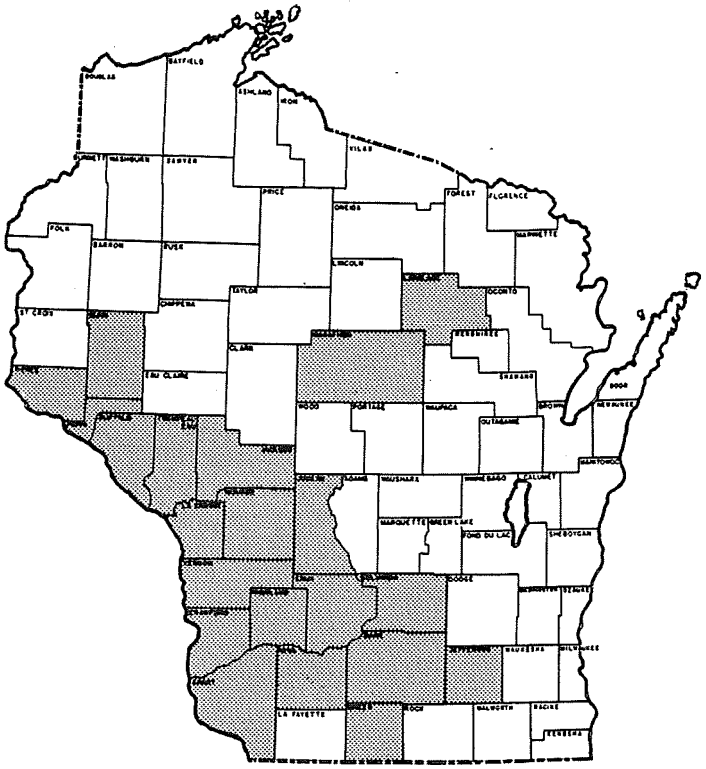

Figure 5. Known county distribution of Butternut Canker in Wisconsin - 1984.

CHERRY

Eastern Tent Caterpillar - Malacosoma americanum (Hubner)

Numbers of tents on cherries remained at low levels in the southern counties but increased in the northwestern counties.

Cherry Scallop Shell Moth - Hydria prunivorata (Ferguson)

About 300 acres of mature black cherry in a mixed oak-cherry stand was completely defoliated in Columbia County. Scattered pockets were also observed in Jackson and other west central counties.

ELM

Dutch Elm Disease - Ceratocystis ulmi (Buisman) Moreau

Dutch Elm Disease has been present statewide since 1975. By 1983, approximately 77% of the 1968 elm population had died from Dutch Elm Disease. Elm continued to die in 1984 and an increase in incidence was observed in northwestern Wisconsin. No new surveys are planned for this disease but observations of incidence will continue.

HEMLOCK

Hemlock Mortality

Moderate hemlock mortality was scattered over 2,500 acres on Chambers Island off the northwest end of Door County. Defoliation was severe in 1983 and loggers on the island reported defoliation in 1981 and 82. Evidence of the hemlock looper was present but not enough to cause the severe defoliation. Signs of Armillaria root rot were common on dead and dying hemlock, but Armillaria is often associated with declining trees and may be a secondary cause of decline. No needlecast fungi were found.

On the Menominee Tribal Forest in northeastern Wisconsin, Menominee County, an annual loss of approximately 1,500,000 board feet/year of hemlock has occurred since 1970. Diseases, insects, severe weather, and logging damage are all contributing to the mortality. Dead timber that is cut and utilized is not included in this figure. A post harvest root rot caused by the fungus Armillaria sp. is one of the factors causing mortality of hemlock. A study at the school of forestry at Michigan Technological University was initiated in 1984 to clarify the role played by Armillaria sp. in hemlock mortality.

LARCH

Larch Needlecast - Mycosphaerella laricina (Hartig)

Mycosphaerella needlecast of European larch was first reported in Wisconsin and North America in 1980. This disease has been previously reported in six counties in western Wisconsin. One new county location, Richland County, town of Willow, (T11N, R2E, Sec. 33) was reported in 1984 (Figure 6). Two trees approximately 12 years old, were severely defoliated, on a 150 acre farm where European larch are scattered throughout the area. This location will be monitored for spread of the disease.

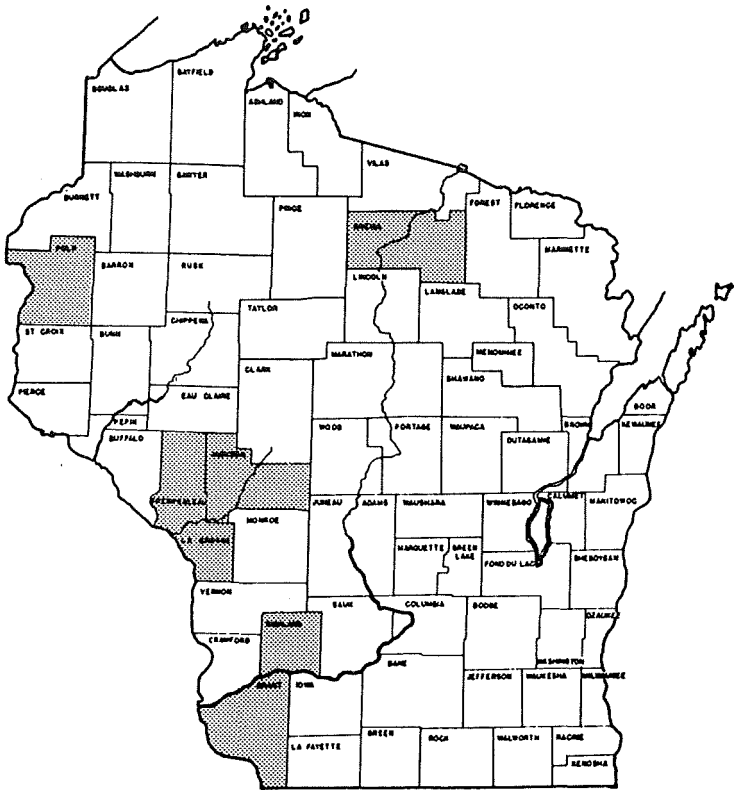

Figure 6. Known County distribution of Larch Needlecast in Wisconsin-1984.

Surveys of the Wisconsin State forest tree nurseries at Hayward, Wisconsin Rapids and Boscobel resulted in no disease detected on seedling stock. In a 10 acre Polk County plantation (Town of Lorraine) where 80-100% defoliation has been occurring since 1981, approximately 40% of the trees are in an advanced state of decline. Defoliation is expected to continue.

Defoliation continued in scattered small plantations (less than 2 acres) in the Coulee Experimental Forest, La Crosse County. One .5 acre plantation, approximately 20 years old, showed defoliation primarily in the lower crowns. Disease severity appears to be decreasing in this plantation. In a younger plantation, approximately 5 years old, trees were almost completely defoliated.

Researchers from the US Forest Service, North Central Forest Experiment Station, have planted European larch from eight seed sources one western larch seed source, and one Siberian Source, adjacent to an infested plantation on the Coulee Experimental Forrest in La Crosse County to determine the susceptibility of these varities. This year was the first of a three year study.

Larch Sawfly - Pristiphora erichsonii (Hartig)

An infestation near Gordon (T43, 44N, R12W) in Douglas County collapsed in 1984.

MAPLE

Maple Webworm - Tetralopha asperatella (Clemens)

Pockets of heavy defoliation of these two late-summer defoliators caused pockets of heavy to severe defoliation on several thousand acres of the maple component of northern hardwood stands in Forest, Langlade, Oneida, and Vilas Counties.

Greenstriped Mapleworm - Dryocampa rubicunda (Fab.)

Severe defoliation of understory red maple occurred in T46N, R11W of Douglas County. Red maples were completely stripped on 200 acres while sugar maple was only lightly defoliated.

Wooley Alder Aphid - Paraprociphilus tesselatus (Fitch)

A light infestation in Washburn County on silver maple declined in 1984.

OAK

Actinopelte Leaf Spot - Actinopelte dryina (Sacc.) (Hoehn)

This disease caused leaf spotting and browning on red and black oaks in west central and Southern Wisconsin. Browning was heaviest from mid August to early September.

Oak Wilt - Cerctocystis fagacearum (Bretz) Hunt

Oak Wilt, now present in 49 counties (Figure 7) was surveyed aerially and with ground checks in 1984. The aerial survey concentrated on noninfected counties that border infected counties. No new county records were found but two additinal locations were detected near Legend Lake in Menominee County in Sections 16 and 17, T28N, R16E. On a private woodlot in the Legend Lake area, a land owner has trenched to break the root grafts of a one acre Oak Wilt pocket. This area will be monitored for effectiveness of control. In 1985, aerial and ground surveys will continue along the northern edge of Menominee County and Marinette County.

Oak Webworm - Archips fervidanus (Clemens)

Large numbers of webs continued on scrub oak in southeastern Douglas County.

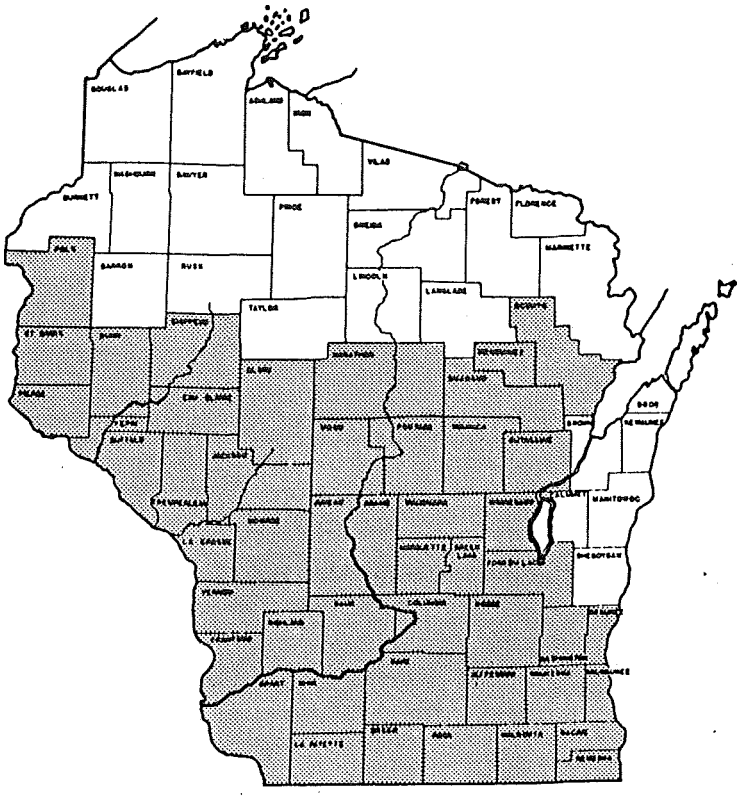

Figure 7. Known county distribution of Oak Wilt in Wisconsin - 1984.

Oak Skeletonizer - Bucculatrix ainsliella Murtfeldt

No defoliation was reported but late-summer cocoons indicated a rising population in Sauk, Dane and Green Counties.

A Seed Chalcid - Megastigmus sp.

Red oak acorns were heavily attacked by a gall-forming Megastigmus sp. in northeastern Bayfield County. Small galls that looked like apple seeds formed between the cup and the acorn causing indentations in the acorn. Larvae were found in the galls.

PINE

Diplodia Canker and Shoot Blight - Sphaeropsis sapinea (Fr.) Dyko and Sutton

Diplodia canker and shoot blight was scattered throughout red and jack pine plantations and natural stands in Douglas County townships of Gordon, Highland, and Solon Springs. Infected trees are scattered over 5,000 acres and most are 3-15 years old.

Symptoms on red pine started showing in early September and included a lime-green coloration of the foliage, dead shoots, dead whorls of branches, dead crowns, and stem and branch cankers. On jack pine, the trees faded in color from the oldest foliage to the newest. Whole brown trees were also observed. In 1977, this disease infected red and jack pine in Douglas County, T44N, R11W, Sec 3 and T45N, R11W, Sec 24. Infected trees died or were deformed, but the disease did not appear to have spread to adjacent non-infected stands. In 1985, plots will be set up in the new infested area to observe symptoms and spread.

Diplodia shoot blight continued to infect red pine windbreaks at Hayward, Griffith, and Wilson State Forest tree nurseries. Diplodia shoot blight inoculum from windbreaks can infect red pine seedlings in the nursery. Managers at all three nurseries are removing infected windbreak trees as a control measure.

Pine Wood Nematode - Bursaphelenchus xylophilus (Steiner and Buhrer)

A new county location of the pine wood nematode was found in 1984 in Dunn County (T30N, R13W Sec 2) in a recently thinned red pine wind break, approximately 35 years old. Signs of Armillaria root rot (rhizomorphs and mycelial fans) and red pine shoot moth were also present in this wind break. Twenty-two widely scattered counties have now been confirmed to have pinewood nematode (Figure 8).

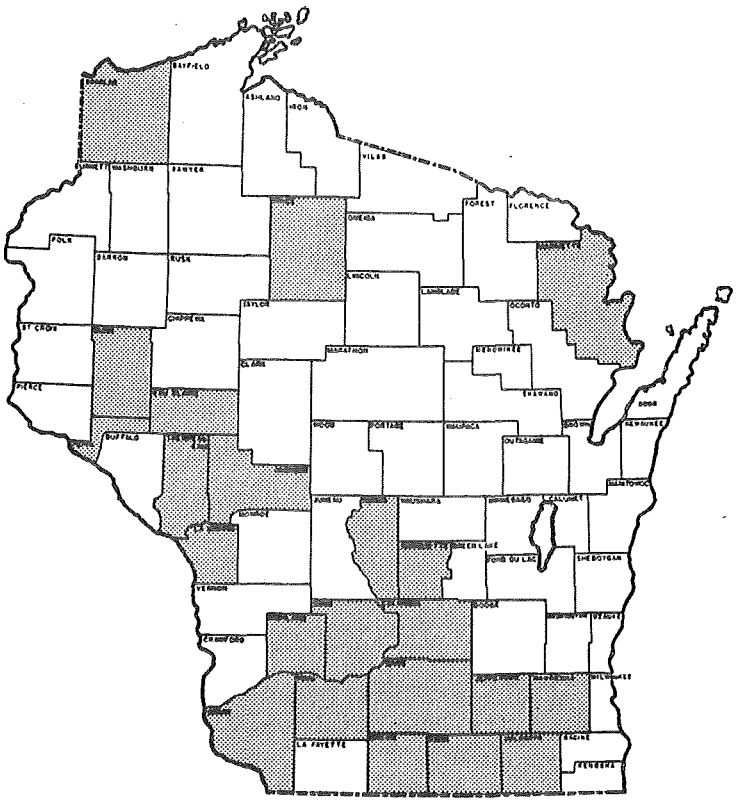

Figure 8. Known county distribution of Pine Wood Nematode in Wisconsin - 1984.

Root Rot - Armillaria mellea Vahl. ex Fr.

Signs of this disease were observed on red pine in 30-40 year old declining windbreaks and plantations. In Dunn County, signs of Armillaria mellea (rhizomorphs and mycelial fans) were observed in a one acre pocket of dead and dying 35 year old red pine in a windbreak. In Wood County, a four acre pocket of 40 year old dead and dying red pine is present on a 40 acre plantation of white and red pine. The mushrooms, rhizomorphs, and mycelial fans of A. mellea were all present. See report in this publication on Red Pine Decline and Mortality for details.

Scleroderris Canker - Gremmeniella abietina (Lagerb.)

To date, Scleroderris canker has been reported in 11 counties in Wisconsin (Figure 8). No new county locations of Scleroderris canker were reported in 1984. There was an increase in the number of infected trees in northern Bayfield County in 1983. In 1984, the incidence and severity appeared to remain static or decrease. A survey was conducted in Bayfield County in areas previously infested, for identification of red pine with current infection by Scleroderris. Twenty-six locations were surveyed and samples from 18 tentatively positive areas were collected for laboratory analysis. Gremmeniella abietina was not isolated from any of these samples. The collections and isolations will be repeated in 1985.

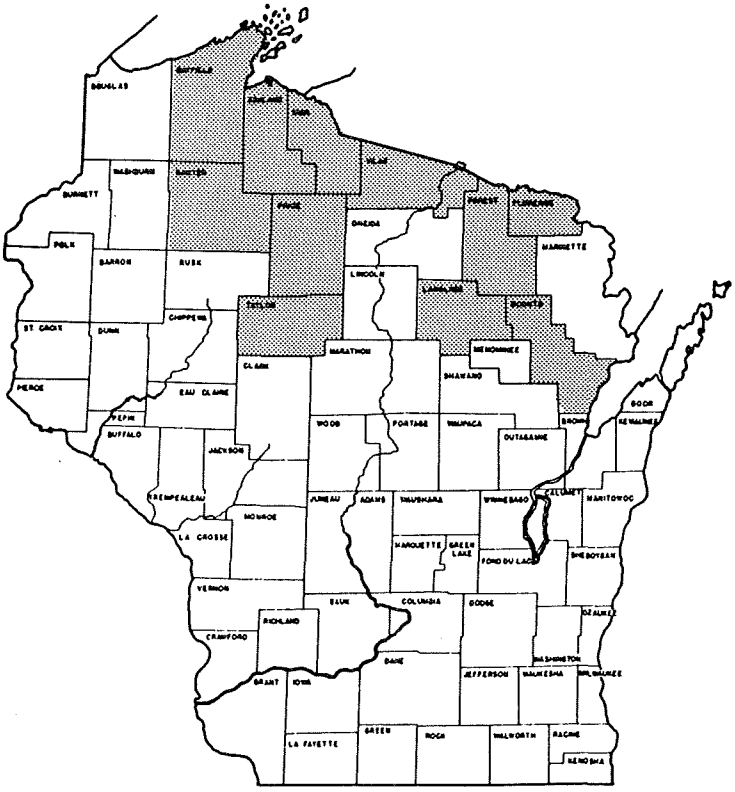

Figure 9. Known county locations of Scleroderris canker in Wisconsin - 1984.

Red Pine Shoot Blight - Sirococcus strobilinus (Pruess)

Red pine shoot blight has been previously reported in seven counties in northern Wisconsin (Figure 10). No new county locations were observed in 1984.

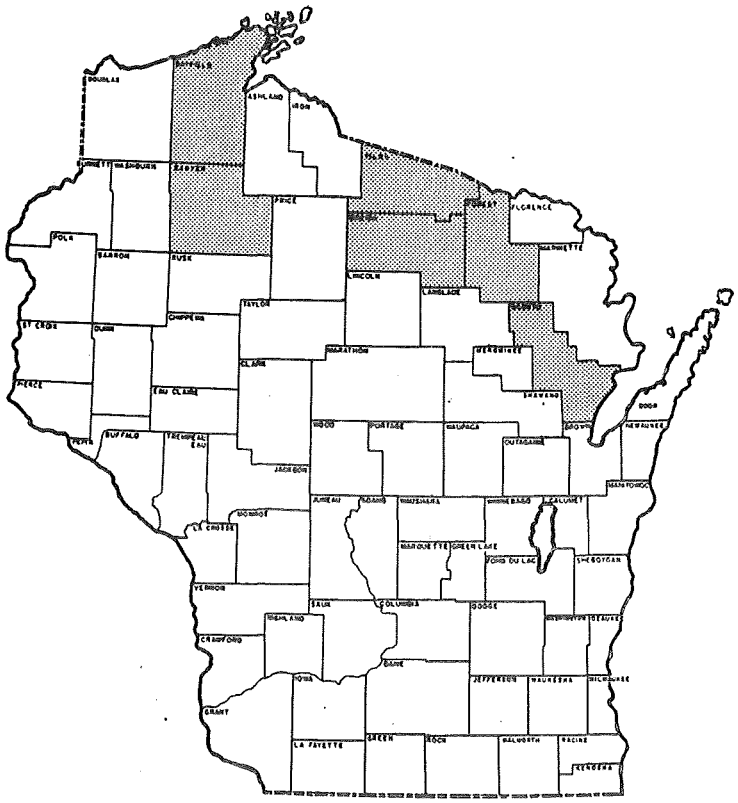

Figure 10. Known county locations of Red Pine Shoot Blight in Wisconsin - 1984.

Red Pine Decline and Mortality

Pockets of declining and dying red pine in plantations and windbreaks have been observed throughout central and southern Wisconsin. This problem most commonly occurs in 35-40 year old plantations. Specific locations have been investigated (Table 1). Several pests are commonly present; red pine shoot moth, Armillaria root rot, Diplodia shoot blight, root collar weevil, root tip weevil, bark beetles, and pine wood nematode. Different combinations of these pests have been observed in different plantations. Not one of these pests can be attributed to being the cause. Symptoms include a rounding off of the crown due to a decreased height growth, stunted chlorotic needles, and scattered brown shoots. The mortality spreads in all directions in a pocket-type formation. The rate of spread varies from stand to stand, but the pocket can enlarge as fast as an acre per year. Two plantations, one in Green and one in Iowa County, were sanitized. All the dead and dying trees were removed, but mortality continued to occur in these areas despite the sanitation.

TABLE 1. Locations of red pine decline and mortality investigated in 1984.

County	Legal Description	Disease Description
Dunn	T30N, R13W, Sec. 2	One acre pocket of dead and dying red pine, in a windbreak, approximately 35 years old. Windbreak thinned within the last 3 years. Pests observed include red pine shoot moth, Diplodia shoot blight, pine wood nematode, Armillaria root rot, and old root collar weevil damage.
Wood	T22N, R5E, Sec. 28	A four acre pocket of red pine in a 40 acre stand of red and white pine in the Wood County forest. Pocket has been thinned twice and is approximately 40 years old. In addition to white pine, aspen and oak are scattered on this 40 acre area. Armillaria root rot was observed (mushrooms, rhizomorphs and mycelial fans), and the pine wood nematode was isolated from dead trees.
Green	T1N, R6E, Sec. 3	Thirteen acre plantation at Cadiz Springs State Park, with two expanding pockets of dying trees. Plantation approximately 35 years old and thinned in 1975 and '76. In 1983, one pocket was sanitized and all dead and dying trees (approximately 12) were cut and removed. In 1984 each pocket expanded approximately .5 acres. No root rot detected. Scattered dead laterals and thin crowns. No Diplodia shoot blight.
Sauk	T8N, R4E, Sec. 19	Two .25 acre pockets in a 17 acre plantation approximately 40 years old have been expanding since 1972. Root mortality, Diplodia shoot blight, old root collar weevil damage and pine wood nematode have all been found in this plantation. In 1981 and '82, all the dead and dying trees in one pocket were removed, but mortality continued to spread in 1983 and '84. The plantation was thinned in 1975.

Jack Pine Budworm - Choristoneura pinus (Rohwer)

The epidemic population in northwestern Wisconsin extended in a southwest direction where rising larval numbers caused widespread light defoliation in Burnett, Washburn, and Polk Counties (Figure 11). About 132,000 acres of heavy defoliation occurred and a much larger area was lightly defoliated. Within the heavily defoliated area about 50,000 cords of pole sized jack pine has suffered topkill or tree mortality. The population remained about static in Douglas County and began falling in Bayfield County. Egg mass surveys show that the 1985 population should rise in Burnett, Washburn and Polk Counties and fall in Douglas and Bayfield Counties. An isolated pocket of defoliation in Jackson County decreased with moderate defoliation of 2500 acres.

Phenological notes:

May 23 - Second instar larvae dispersing in Douglas and Bayfield Counties.

June 20 - Pupation beginning Jackson County.

June 27 - Pupation beginning in Douglas Counties; about 75% have pupate in Jackson County.

July 3 - Most have pupate in the northwestern counties.

July 11 - Moth flight beginning Douglas and Bayfield counties; most moths have emerged in Jackson County.

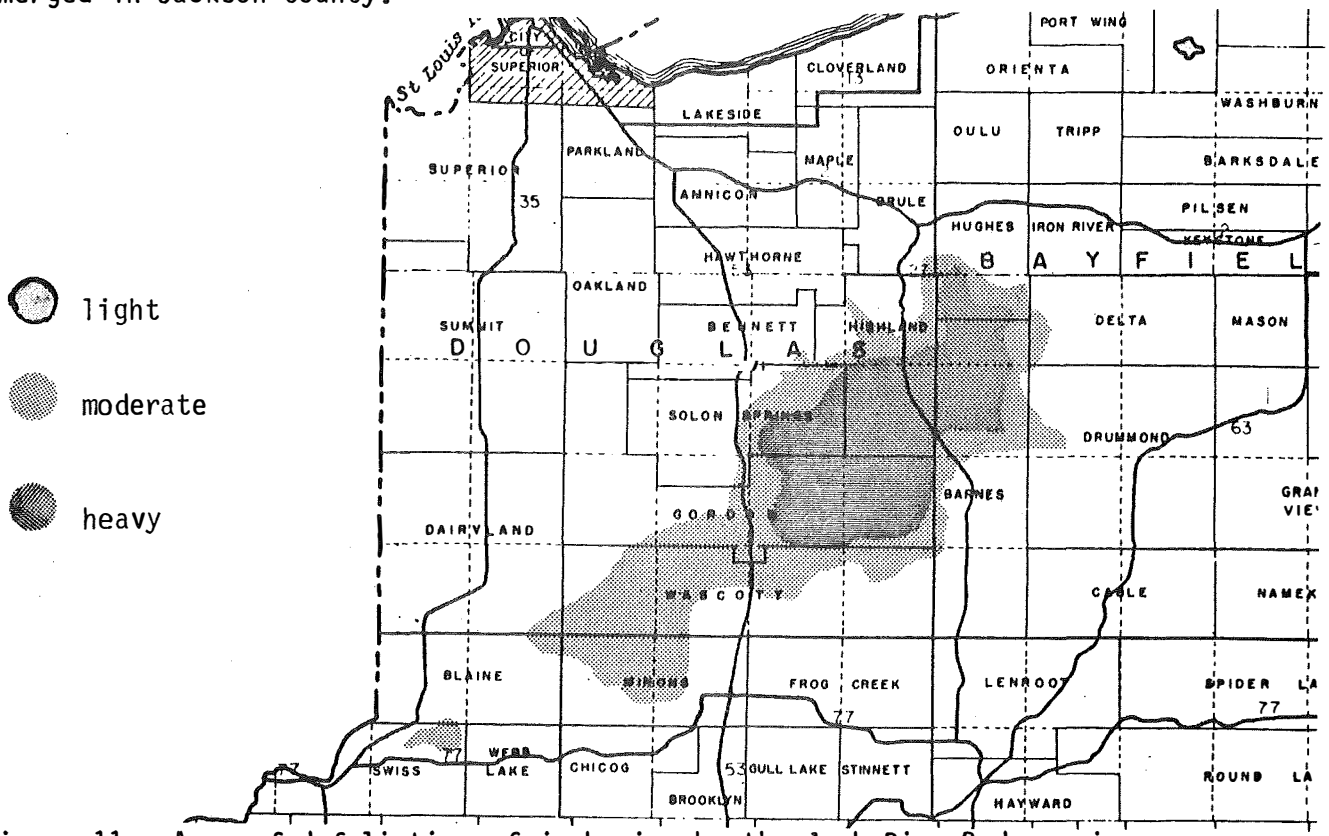

Figure 11. Area of defoliation of jack pine by the Jack Pine Budworm in Wisconsin - 1984.

Pine Tussock Moth - Dasychira pinicola (Dyar)

Populations continued at extremely low levels in Douglas and Bayfield Counties where an outbreak collapsed in 1983.

Red Pine Needle Midge - Thecodiplosis piniresinosae (Kearby)

Populations continued at very low levels. One red pine plantation near Yellow Lake in Burnett County had light, but clearly visible browning of needles.

Gouty Pitch Midge - Cecidomyia piniinopsis O.S.

Light damage to twigs was observed in Douglas and Bayfield Counties.

European Pine Sawfly - Neodiprion sertifer (Geoffroy)

Populations increased in area and severity, despite heavy egg mortality due to extremely cold winter temperatures. About 1100 acres of red pine were moderately defoliated in scattered pockets in Waukesha, Jefferson, Dane and Green Counties.

Several growers applied the nucleo polyhedrosis virus product, Neocheck-s. Some applications successfully controlled the larvae; two applications in Jefferson County failed. The cold, rainy, windy spring weather was the probable cause of the failures.

Phenological note:

May 10 - First egg hatch in Jefferson County.

Red Pine Sawfly - Neodiprion nanulus nanulus (Schedl)

Populations in Marquette County declined; populations in the Wisconsin River Valley in Iowa and Sauk Counties increased somewhat. No significant defoliation was reported.

Redheaded Pine Sawfly - Neodiprion lecontei (Fitch)

A general increase occurred in northern Wisconsin populations. Many new infestations were found in Sawyer, Iron, Vilas, Lincoln, Oneida and Langlade Counties. Known infestations in Forest County increased in severity pockets of moderate to heavy defoliation in sapling red pine plantations will cause top kill and some tree mortality to become evident in 1985.

About 160 acres of red pine plantations were sprayed with ground applications of malathion at 10 oz. per acre in Forest, Langlade and Iron Counties by industrial and private landowners.

Phenological notes:

June 14 - First adults observed in pheromone traps in Forest County.

Introduced Pine Sawfly - Diprion similis (Hartig)

A slight increase was made apparent by the frequent sighting of individual larvae over much of southern Wisconsin, but populations remained generally low. Light defoliation of open-grown white, scotch and jack pine was observed in Oneida and Vilas Counties. Populations were noticeably lower in the northwestern counties.

Red Pine Shoot Moth - Dioryctria resinosella Mutuura

Populations remained very low in the hazard zone in the central counties (Figure 12).

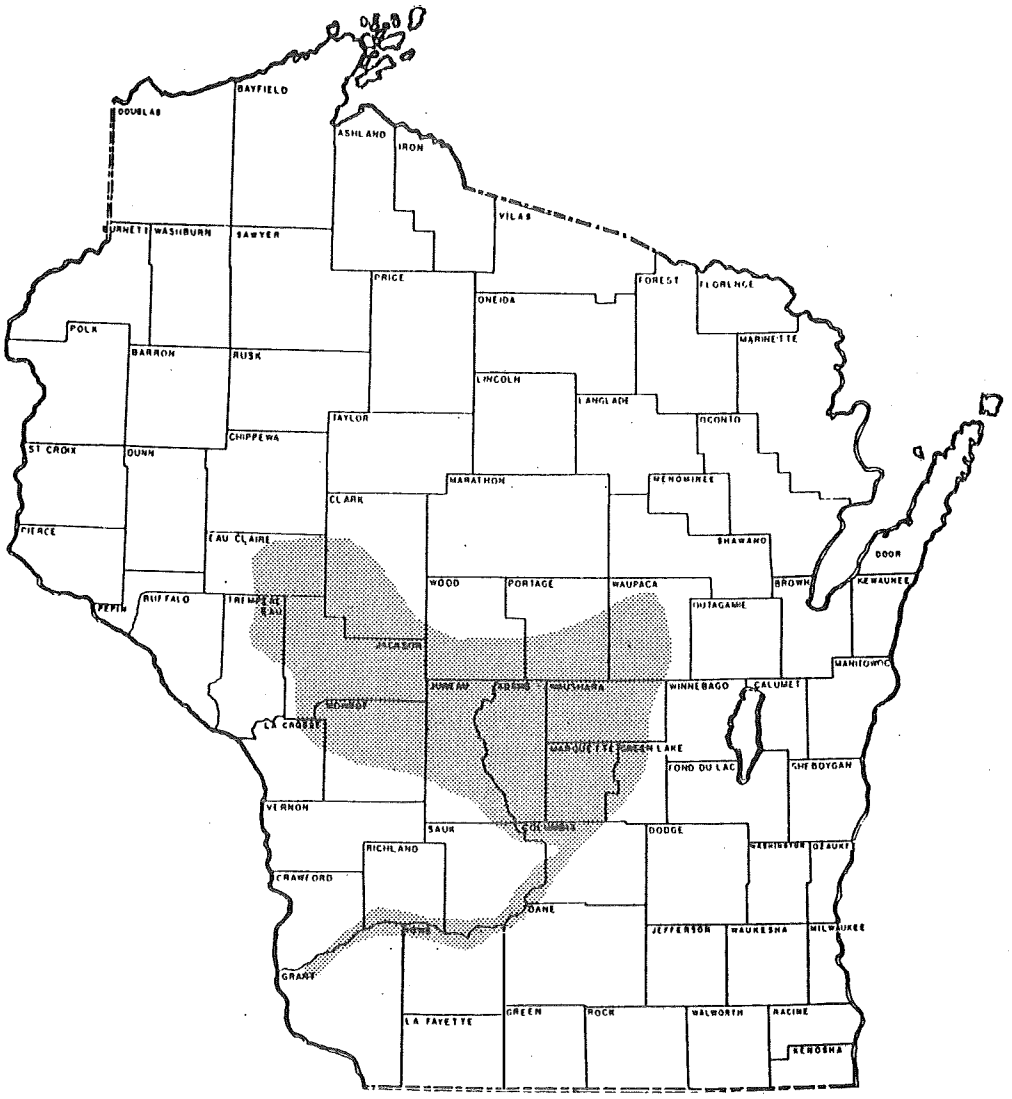

Figure 12. High hazard zone for the occurence of the Red Pine Shoot Moth in Wisconsin - 1984.

Saratoga Spittlebug - Aphrophora saratogensis (Fitch)

Populations generally remained steady in 1984. Because of the increased acreage of red pine of susceptible age, more acres are being surveyed and treated.

Of 7,000 acres surveyed, in northeastern Wisconsin for nymphs, 517 acres had high numbers. About 317 acres in Menominee County were sprayed with backpack mistblower applications of Malathion at a rate of 10 oz. per acre. Another 200 acres in Vilas County were not sprayed because of bad weather. Some herbicide treatments were conducted in Menominee County to control alternate host vegetation.

Pine Spittlebug - Aphrophora parallela (Say)

Populations decreased in Douglas and Bayfield counties but spittle masses were common.

Pine Root Collar Weevil - Hylobius radicis (Buchanan)

Windbreak and poorly stocked red pine plantations were heavily damaged in western Washburn County and central Burnett County. Heavily damaged trees were usually 15-25 years old and most were broken off at the ground line.

White Pine Weevil - Pissodes strobi (Peck)

Attacked white pine and jack pine tips increased in the central counties. A jack pine sapling stand in Marquette County had about 50% of the leaders killed.

Pine Bark Beetles - Ips sp.

A wet spring and early summer helped prevent bark beetle outbreaks in widespread park pine blowdown areas in the northwestern counties. A tornado in Menominee County flattened large areas of red pine pole and sawtimber. Second generation Ips pini were extremely numerous.

White Pine Needle Blight - Atmospheric gases

White pine needle blight which can be caused by atmospheric gases such as ozone or sulfur dioxide was prevalent in windbreaks and Christmas trees in Green County. Incidence of this disease decreased from 1983 incidence in Waushara, Waupaca, Marquette and Portage Counties.

White Pine Needlecast - Scirrhia acicola (Dearn.) Siggers

The fungus Scirrhia acicola caused needlecast of white pine in four locations in western Wisconsin (Table 2). This is the first report of this disease occurring on white pine in Wisconsin. In Buffalo County, white pine in a natural stand of mixed hardwoods showed defoliation, primarily in the lower crowns. Overstory and understory trees were affected. Scattered yard trees were also affected. A natural stand of white pine (15 to 90 years old) in Jackson County also showed moderate defoliation from needlecast. In Burnett County, a 3 acre natural white pine stand mixed with jack pine, red pine and oak showed defoliation. Approximately 150 trees were infected and heavy defoliation occurred in the lower crowns. In Douglas County, a single white pine tree in front of the DNR Brule Area headquarters was infected. In all locations, the needlecast was localized. Symptoms include brown banding of 1983 needles in June 1984, chlorosis, and defoliation of 1983 needles from mid June through mid July, 1984. Affected branches have a tufted appearance. Development of this disease will be observed in affected areas in 1984.

TABLE 2. Known locations of Brown Spot (Scirrhia acicola) on white pine in Wisconsin - 1984.

County	Legal Description	Disease Description
Buffalo	T25N, R13W, Sec 6	Scattered on over and understory white pine in a 2 acre woodlot and yard.
Burnett	T38N, R15W, Sec 5 & 8	Scattered throughout a 3 acre natural stand. Overstory and understory affected.
Douglas	T47N, R10W, Sec 23	Single tree at Brule Area headquarters
Jackson	T20N, R4W, Sec 17 & 18	Scattered throughout a 2 acre natural stand. Overstory and understory affected.

BLACK WALNUT

Black Walnut Canker - Fusarium sporotrichioides Sherb.

In southwestern Wisconsin, a trunk canker has infected three known walnut plantations (Table 3). The black, elongate canker was scattered throughout the sapling size plantations, causing decline and mortality. This canker has not been observed in natural stands in Wisconsin. A fungus, Fusarium sporotrichioides Sherb. has been identified as the cause, by Professor James E. Kuntz and Rodney Caldwell at the University of Wisconsin, Madison. The two-five acre plantations and one-ten acre plantation, are located on bottom land sites; two are mixed with white pine plantings. A cooperative study between the University of Wisconsin, Dept. of Plant Pathology, and the DNR, was initiated at a Vernon Co. plantation to determine if a correlation could be found between the time of pruning and time of infection by Fusarium. Cankered and noncankered trees were pruned once a month for six months, from May through September. Observations are being made on the study trees for canker development. Research at the University of Wisconsin-Madison, is continuing on possible silvicultural control.

Black Walnut Wilt Unknown

The same plantations listed in Table 3, also have saplings dying from Walnut wilt. Symptoms include a sudden wilting of the leaves followed by necrosis then dieback of the upper branches. Profuse epicormic branching at the base of the crown and patches of dead cambium are also very common. Heavy mortality, approximately 30% loss, from this disease was observed in the Vernon and Crawford County plantations. Many trees wilted and died in late summer. Black lesions on leaves and rachises, and small twig cankers are often present on declining trees. Researchers at the University of Wisconsin-Madison are trying to determine the cause. The spread of this disease will be monitored in currently infected plantation in 1985.

TABLE 3. Known locations of Black Walnut Canker and Decline in Wisconsin - 1984.

County	Legal Description	Disease Description
Vernon	T11N, R5W, Sec. 18	Canker and decline present on saplings. Decline incidence increased dramatically in 1984. Approximately 5 acres affected.
Crawford	T10N, R3W, Sec. 17	Decline scattered throughout a 5 acre sapling plantation. Only an occasional trunk canker. Walnuts mixed with White pine.
Vernon	T12N, R5W, Sec. 6	Moderate decline throughout a 2 acre walnut plantation. Walnuts approximately 15 years old.
Grant	T6N, R5W, Sec. 4	Canker and decline causing heavy mortality on approximately 10 acres of walnut and white pine plantation.

Walnut Caterpillar - Datana integerrima (Grote)

Caterpillar numbers were reduced considerably from the extreme high of 1983 but still caused local heavy defoliation in scattered locations in southern Wisconsin. Some growers reported mortality of sapling black walnut from 1983 defoliation.

A Shoot Borer - Acrobasis sp.

Bud damage was generally drastically reduced from 1983 levels. Pockets of light bud damage were found in Iowa County.

A Leaf Beetle - Paria quadrinotata

Early spring bud mining by adults of this beetle was considerably reduced. A few pockets persisted in Richland County.

MISCELLANEOUS SPECIES

Gypsy Moth - Lymantria dispar (L.)

The numbers of male gypsy moths caught in pheromone traps dropped to less than half the 1983 levels. The numbers in known infestations dropped as well as the number of suspected "hitch hikers". A possible new infestation was discovered in Shawano County. Table 4 summarizes the 1984 trap catches.

Eradication treatments:

Monona - This infestation was discovered in 1981 when 236 male moths were caught using delimitation trapping. Intensive trapping arrays in 1982 and 1983 caught 113 and 40 male moths respectively. A very intensive array of 9 traps per acre caught 7 moths in 1984. Burlap banding yielded 31 larvae and pupae in 1982, 34 in 1983 and none in 1984.

Continued intensive trapping is planned in 1985.

Okauchee/Oconomoc Lake. This infestation was first identified in 1977. In 1978, 643 male moths were caught with a delimitation trapping array. Various parts of the infestation have been treated with nucleopolyhedrous virus, 2 different formulations of disparlure, a ground application of Carbaryl, and 2 aerial applications of Bacillus thuringiensis. In 1984 a high density trapping array yielded 28 male moths.

A controlled burn followed by high density trapping is planned for 1985.

Elm Grove - This infestation was detected in 1981 and delimited in 1982 when 70 male moths were caught. A 60 acre area was treated twice with Bacillus thuringiensis in 1983; 3 moths were caught with high density trapping. No moths were caught with high density trapping in 1984.

Hubertus - This infestation was first identified in 1983, with the capture of 39 moths in 4 traps and the discovery of gypsy moth egg masses in Hubertus. High density trapping at 3 traps per acre in 1984 caught 7 moths in 4 traps, 1 female moth and 3 egg masses were found here in the same year. Ground spray of B.t. followed by high density trapping is planned for 1985.

Sheboygan - Multiple catches in northeastern Sheboygan in 1983 (18 moths in 7 traps) and 1984 (5 moths in 4 traps) indicate the presence of an infestation. High density trapping is planned here for 1985. Moths were also caught at the southern edge of the city, which need further delimiting.

Fall Webworm - Hyphantria cunea (Drury)

Populations increased dramatically above the high 1983 levels. The highest populations occurred near the Mississippi River where open-grown black walnut trees were completely covered with webs. Webs were common throughout the state where many hardwood species were defoliated.

TABLE 4. Gypsy moth males caught in pheromone traps in 1985 and egg masses collected in egg mass survey. One adult female was collected near a grap in Hubertus. From Wisconsin Cooperative Pest Survey Bulletin. (October 15, 1984).

County	Community	No. of Moths	County	Community	Moths
Ashland	Mellen	3	Sauk	Lake Delton	1
Dane	Madison (City)	1	Shawano	Bonduel	5
	Madison (Town)	1	Sheboygan	Sheboygan	8
	Monona	7	Waukesha	Brookfield	1
Eau Claire	Eau Claire	1		Delafield (Town)	1
Kenosha	Parkside	1		Elm Grove	1
Marathon	Rothschild	2		Oconomowoc (City)	1
Marinette	Peshtigo	2		Oconomowoc (City)	28+3EM*
Milwaukee	Glendale	1	Washington	Hubertus	8+1f*+3EM*
	Wauwatosa	1	Winnebago	Menasha	1
Monroe	Fort McCoy	1	----------		
Portage	Plover	1	State Total		79+1f
Rock	Beloit	1	*EM = egg mass		*f = adult female

Winter Injury

Browning of 1983 foliage in April, 1984, was widespread in Christmas tree plantations throughout Wisconsin. Susceptible varieties of Scotch pine (short needle varieties) showed browning in April and May and gradual needle loss of 1983 needles throughout the summer. Red pine and Norway spruce Christmas trees were moderately affected and showed scattered browning.

Overstory Scotch pine at the DNR headquarters, at Trout Lake, Vilas County, showed browning of 1983 needles in early June.

CHRISTMAS TREES

Cyclaneusma Needlecast - Cyclaneusma minus (Formerly Naemacyclus minor)

This needlecast disease which is commonly present in low levels in Wisconsin, increased in severity in 1984. Cyclaneusma needlecast causes early yellowing, needle loss, weakness, and degrades Christmas trees. Many growers experienced severe defoliation of Scotch pine due to a combination of winter injury and Cyclaneusma. A survey of disease incidence on Christmas trees in central Wisconsin is planned for 1985. Cyclaneusma needlecast was observed on Mugo and Scotch pine during an inspection by the Wisconsin Dept. of Agriculture of private nurseries in Washburn, Burnett, Douglas, Door and Shawano Counties.

Lophodermium Needlecast - Lophodermium pinastri (Schrad. ex Hook.) Chev.

In 1983, incidence of Lophodermium needlecast was severe on Scotch pine in Jackson, Langlade, Oneida, Portage, Shawano, Waupaca, Waushara, and Wood Counties. Christmas tree growers sprayed protective fungicides chlorothalonil and maneb in September 1983, to prevent infection by Lophodermium. The incidence of this disease decreased significantly probably as a result of the combination of good control spray programs and unfavorable weather conditions for development and sporulation of the fungus.

In 1984, a severity survey was conducted by the DNR on Scotch pine in Waushara and Portage Counties. Approximately 1,500 acres with 150,000 trees were surveyed. One percent of the 150,000 trees were ranked for severity of Lophodermium needlecast (Table 5). The economic loss to growers was determined by using the average value of Christmas trees sold from central Wisconsin (Table 6). Figures are based on the wholesale value. The loss figures in Tables 5 and 6, include only the losses incurred if the infected trees are cut and sold. Some growers may choose not to cut the trees, but will implement a control program, and produce trees with two or three years of noninfected foliage. If this strategy is followed, the cost of fungicidal sprays and taking the land out of production is an additional financial loss. If disease control measures are successful, the tree can often be sold without a downgrade, but if the needlecast continues, the trees may be unsaleable.

TABLE 5. Description of severity ranking of Christmas trees for Lophodermium needlecast and value loss by grower at wholesale level as a result of downgrade from needlecast.

Severity Rank	Tree Description	Wholesale Value Loss Per Tree ($)
0	Grade #1 tree, no needlecast, can be sold in the 5.5' - 7' category	$0.00
1	Defoliation from needlecast moderate, reduces grade and value of tree	$2.44
2	Defoliation from needlecast severe, the bottom of the tree must be cut off and the tree sold in the 4'-5.5' category.	$3.35
3	Defoliation from needlecast severe, tree unsaleable.	$11.73

TABLE 6. Number and percent of trees surveyed in different severity ranks, wholesale value of trees with and without down grade, and total dollars lost.

Severity Rank	Trees (no.)	Trees (%)	Value without downgrade ($)	Value with downgrade ($)	Net Loss ($)
0	13,386	95.24	157,017.00	157,017.00	0
1	453	32.00	5,313.69	5,208.37	1,105.32
2	203	1.4	2,381.19	1,701.14	680.05
3	22	.16	258.06	0	258.06
TOTALS	14,064	100	164,970.72	163,926.51	2,043.43

Storm Damage - Tornado Damage on the Menominee Indian Reservation (taken from report by Kenneth R. Sloan, Menominee Liaison Forester, Wisconsin DNR).

On Friday, April 27, 1984, at least three tornadoes touched down on the Menominee Indian Reservation causing extensive timber damage (Figure 12). Based on preliminary aerial and ground surveys, 3,172 acres of commercial forest land were flattened. An estimated 8,977,794 board feet of sawlog timber plus 38,621 cords of pulpwood were blown down. This estimate does not include the partially damaged areas. Damage by timber type, acreage, and volume is listed in Table 7.

Approximately one half of the damaged timber consisted of jack pine and white pine. Because of this heavy concentration of breeding material for bark beetles, a potential for a drastic increase in the bark beetle population was present. However, prompt salvage of the jack and white pine, and clearing of the slash by chipping, roller chopping, or piling, reduced the potential hazard.

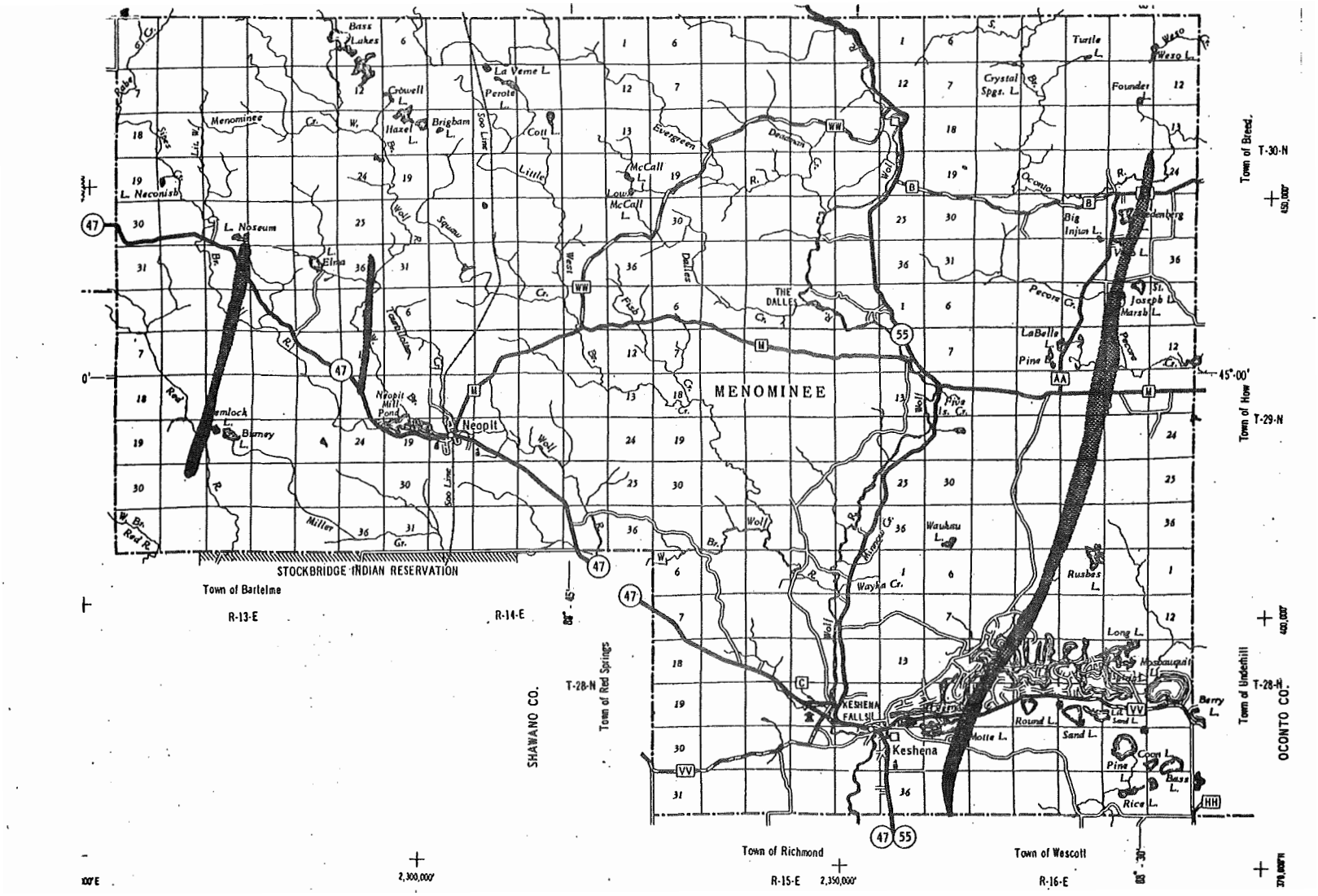

Figure 12. Areas of extensive tornado damage caused by three tornadoes on the Menominee Indian Reservation, on April 27, 1984.

TABLE 7. Acreage and volume losses by timber type on the Menominee Indian Reservation resulting from tornado damage that occurred on April 27, 1984.[1]

Timber Type	Acreage	Cordwood Volume	Board foot Volume
White pine	412	3,874	4,199,776
Northern Hardwood	428	7,643	ND[2]
Jack pine (plantation)	9	45	ND
Aspen	634	6,767	ND
Scrub Oak	71	710	ND
Northern Hardwood	728	6,773	2,557,690
Hemlock-Hardwood	33	627	164,720
Cedar	11	450	27,500
Swamp Conifer	597	8,134	1,420,835
Swamp Hardwood	229	3,298	607,273
Tamarack	20	300	ND
TOTAL	3,172	38,621	8,977,794

[1]Based on compartment recon and forest inventory data.
[2]ND = No data.

NURSERY PROBLEMS

A nursery disease control SWAT team comprised of researchers from the University of Wisconsin, USDA Forest Service, and personnel from Wisconsin Department of Natural Resources, continued to work on diseases and control of forest nursery trees in Wisconsin. Following, is a list of responsibilities of team members.

SWAT Team Action and Responsibilities - 1984

Dr. John G. Berbee, Professor of Plant Pathology and Janet McFall, Graduate Student, Department of Plant Pathology, University of Wisconsin - Madison.

Continue to evaluate soil fumigation practices in state nurseries.

Continue study on mycorrhizae and their possible role as protectants against root rot pathogens.

Dr. Marge Palmer, Plant Pathologist, USFS, North Central Forest Experimental Station, St. Paul, MN.

Research the cause of stunting, and cooperate with nursery managers at Toumey and Hayward to set up field studies.

Continue research on Cylindrocladium isolate in cooperation with scientist at Tuskeegee Institute.

Jaya Iyer, Lecturer, Dept. of Soil Science, U.W.-Madison

Continue to analyze soil and tissue samples from the nurseries and advise on soil fertility and maintenance.

Jaya Iyer and John Borkenhagen, Nursery Superintendent, Hayward State Nursery.

Continue evaluation of the effects of leaf litter placement on conifer seedlings.

Cathy Croghan, Plant Pathologist, USFS, State and Private Forestry, St. Paul, MN.

Continue to evaluate the effectiveness of Bayleton in controlling Eastern gall rust and its effects on formation of mycorrhizae at General Andrews nursery in Minnesota and Hayward Nursery, Wisconsin.

Jane Cummings, Plant Pathologist, Department of Natural Resources, Pest Management Unit, Madison, WI.

Cooperate with Ken Wojahn at Griffith nursery and Dick Camp at Wilson nursery to remove trees in windbreaks that are heavily infected with Diplodia.

Investigate the cause of white pine mortality at Wilson nursery.

Survey for the presence of larch needlecast in the Wisconsin State nurseries.

Cooperate with Cathy Croghan and Dr. Berbee to find an effective and economical chemical for control of damping off.

Cooperate with Dick Camp to develop a control for Pine Bark Adelgid on white pine.

Dr. James Kuntz, Professor of Plant Pathology, Vickie Radke, Specialist and Mike Drilias, Graduate Student, Dept. of Plant Pathology, U.W.-Madison.

Continue to study walnut seed rot and seedling mortality.

Continue to investigate the significance of maple decline and its possible start in the nursery.

Seedling Mortality (Red Pine) - cause unknown

In 1984, John Borkenhagen, superintendent at the Hayward State Nursery, observed mortality of 1-0 red pine. John observed chlorosis (yellowing) in late July and necrosis (browning) in mid-August. An inventory of the most severely affected areas (A-3, K-4, K-5) revealed a 600,000 seedling loss or 23% of the inventory in these 3 sections. An overall loss of 1,000,000 seedlings or 10% of all 1-0 red pine occurred by October 1, 1984. This equals a monetary loss of $20,000 assuming the stock would be sold as 3-0. John collected seedling samples on August 29, September 10, and October 24. Cathy Croghan and Jane Cummings isolated Fusarium spp. from these samples. Jaya Iyer collected soil samples from the affected area in October and found a slight deficiency in Phosphorus, but all other nutrients were sufficient.

On August 31, 1984, John applied a Benlate 50 W soil drench at 10 lb product/200 gal water/a in Block A section 3, and Block K section 4. After spraying with Benlate, half of Section 4 Block 4 was watered for two hours (.4") to test the hypothesis that the Benlate needed extra irrigation to reach the roots. Half of a nonsprayed check section (K-5) was also watered.

On November 29, 1984, a special nursery problems meeting was held to discuss the investigation of this problem if mortality should occur in 1985.

APPENDIX A

EVALUATION OF TRIAMEDIFON FOR CONTROL OF JACK PINE GALL RUST

by

Catherine F. Croghan[1]

An evaluation of foliar applications of Bayleton (triadimefon) for control of jack pine gall rust began in summer 1983 at the General Andrews Nursery, Willow River, MN, and the Hayward Nursery, Hayward, WI. Both nurseries have reported seedling cull due to main stem galls. Based on previous gall rust surveys, these galls were believed primarily to be caused by pine-oak gall rust (Cronartium quercuum f. sp. banksianae).

Bayleton treated 2-0 jack pine seedlings were evaluated for first year gall rust infections at both nurseries. Application of 4 oz Bayleton/A/100 gal water did not give control; percent infections for control and treated stock were not significantly different at either nursery.

A technique for greenhouse inoculation of jack pine seedlings with the pine-oak gall rust fungus became available at the University of Minnesota School of Forestry in 1984. Greenhouse evaluations of three rates of Bayleton for control of pine-oak gall rust were completed in December. This evaluation confirmed our field observation that the 4 oz application rate does not give control. However, the 16 oz rate resulted in significantly fewer gall rust infections. Further evaluation of this and several intermediate rates is planned for February 1985. Results of this work will be used to determine an appropriate field evaluation rate for 1985.

[1]Plant Pathologist, USDA Forest Service, Forest Pest Management, Northeastern Area State and Private Forestry, St. Paul, MN

APPENDIX B

Development of Phermone as a Tool for Monitoring Redheaded Pine Sawfly Populations

By
B. A. Schuh and D. Hall[1]

In northern Wisconsin the adult redheaded pine sawflies (Neodiprion lecontei (Fitch)) emerge from their overwintering cocoons in early June through mid-July. The female emits a sex phermone to attract males for mating. They mate and the female lays her eggs in the needles of red or jack pine Pinus resinosa Ait., P. banksiana Lamb., respectively). After 14-21 days, the larvae close and begin to feed on the foliage. In northern Wisconsin, the redheaded pine sawfly larvae have caused mortality of red and jack pine by completely stripping the trees of both new and old foliage. To prevent serious damage to red pine plantations, forest managers have sometimes used insecticides indiscriminately in attempts to control these sawflies.

Surveys to determine the need for control present special problems for forest managers. Visual surveys for eggs and small larvae are time consuming and unreliable due to the difficulty of finding the insects in these stages. Surveys for mid to late instar are undesirable because damage has already occurred, small yet detrimental infestations may still go unnoticed and insecticides must be applied immediately after discovery to prevent further damage.

A survey procedure that would monitor the adult population would allow reasonable time for control decisions and implementation before injury to pines is significant. This study was initiated to develop a phermone trapping system capable for capturing adult male sawflies in quantities reflective of the population density of an area. Monitoring the adult population allows time for control decisions and implementation before injury to the trees is significant.

Two study plots were selected in the Argonne Block of Consolidated Papers Inc. near Argonne, Wisconsin. The selection of each area was based on past records of sawfly outbreaks and onsite inspection prior to trapping. Selection of the first plantation (Plantation D) was based on a sawfly outbreak the previous year. The second plantation (Plantation C), was selected because of no record of previous sawfly outbreak.

Phercon II traps (Zoecon Corp., Palo Alto, Calif.) were baited with 30 ug of redhead pine sawfly phermone, 3, 7-dimethylpentadecan-2-ol. Phermone was provided by Dr. H. C. Coppel, Department of Entomology, University of Wisconsin, Madison, WI. Eight traps were placed 4-5 feet above ground in red pine trees. There were 8 trap stations in each plantation. Traps were set June 18 and collected July 12, 1984.

In addition to the trap locations in each plantation, a phermone baited trap was located at the Consolidated Papers, Inc. area office. This trap was changed every 4 days, however, the original bait was used in each new trap. This trap station was used to monitor the adult flight period. It was active June 12 through July 12.

[1]Laboratory technician and forest entomologist, Department of Natural Resources, Madison, WI

In Plantation D, (previously infested) 21.57 males per phermone trap were caught between 6/18-7/12. In plantation C (no previous infestation) 11.75 adult males per trap were caught over the same period. With the high number of males caught in plantation C we must conclude that these males immigrated in from surrounding plantations. Whether the males were attracted by the high concentration of phermone or whether they were passing through the plantation and then once in the plantation, attracted by the phermone, we do not know. Further studies with smaller phermone concentrations will help answer this question. The difference in males trapped in plantations D & C 21.57 and 11.75/trap, respectively, indicates a higher level of sawfly infestation in and around plantation D. The office trap data indicated adult flight activity from June 14 through the 28th. Since our first trap was set up on June 14, we do not know when the flight period began.